



SAN ANTONIO
RIVER AUTHORITY

Leaders in Watershed Solutions

Environmental Flows - Validation

BBASC Meeting
December 9, 2014

Overview

- Funded through Texas Water Development Board (\$200K) and the San Antonio River Authority (~\$30K)
- Working with:
 - Bio-West Inc.
 - Baylor University
 - Texas State University
 - Texas A&M University
- Brazos Project

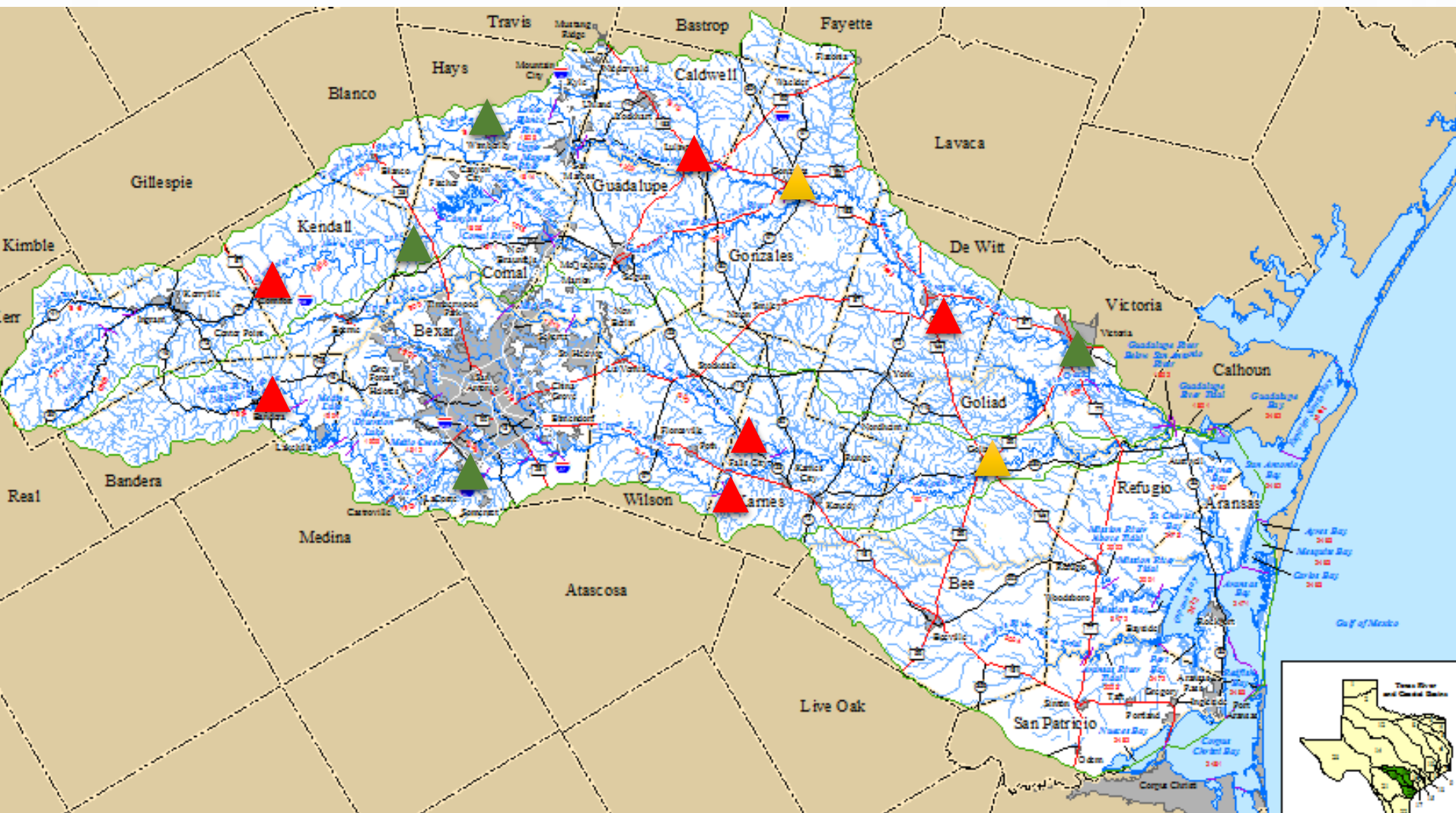
Overview

- Project goal is to enhance the understanding of flow-ecology relationships and develop a methodology for testing established flow standards
- Primarily interested in how pulse flows affects biology

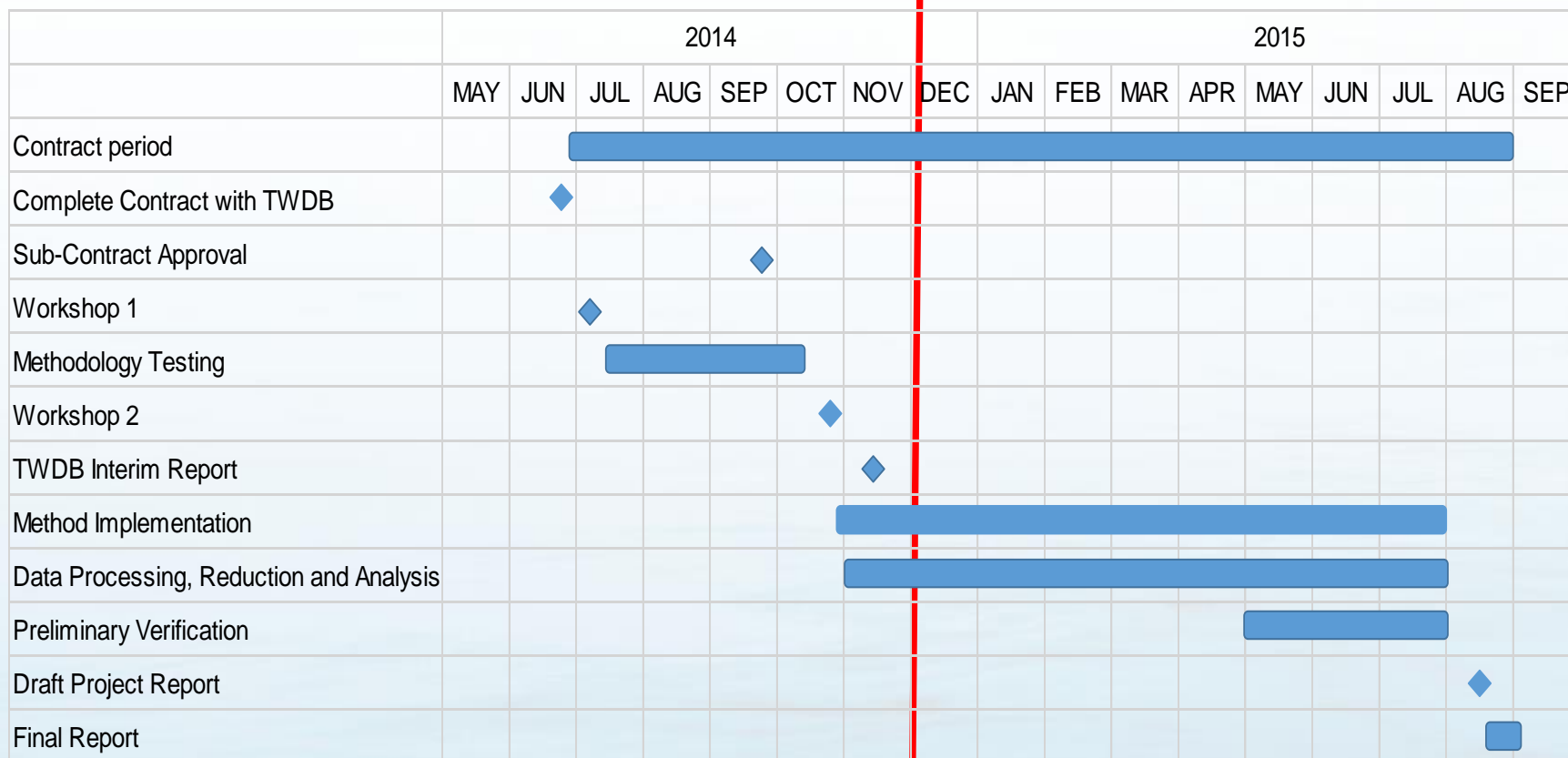
Overview

- Aquatic
- Riparian
- Fish Recruitment (Otoliths)
- Oxbow Connectivity

Study Sites



Timeline



Accomplishments

- Reductions in flow (base and HFP):

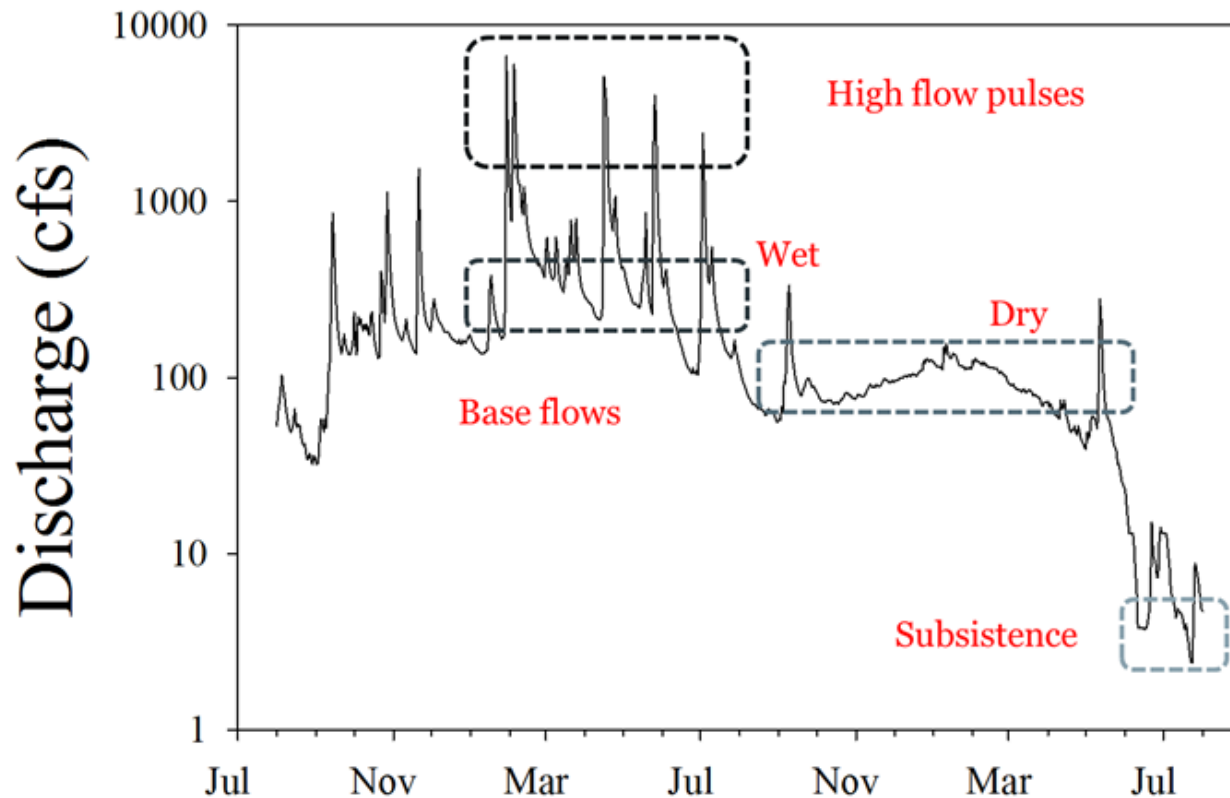
↑ slackwater organisms



↓ swift water organisms



Accomplishments



Accomplishments

Riffle and Run habitats

- Fish community structure
 - Richness, relative abundances, densities
 - Native vs. non-native
 - Swift water specialists vs. slackwater specialists
 - Food consumption
 - Energy into reproduction
 - Condition

Accomplishments

Riffle habitat

- Aquatic insect community structure
 - Richness, relative abundances, densities
 - Swift water specialists vs. slackwater specialists
- Mussel community structure

Accomplishments

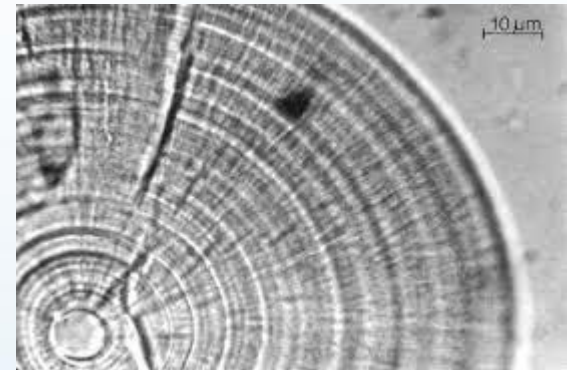
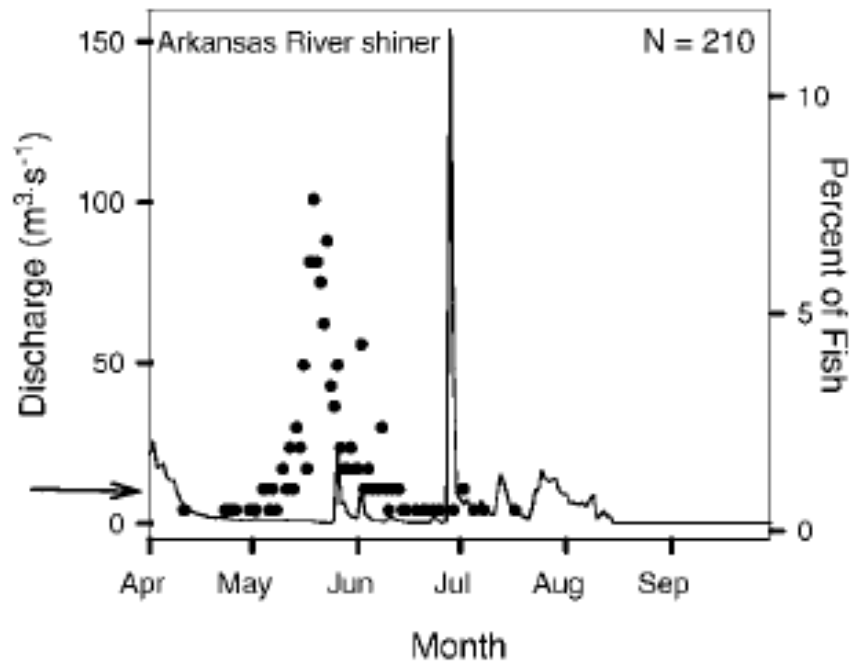
Riffle and Run habitats

- Habitat responses:
 - Shift in substrates (silt, gravel, cobbles)
 - Shift in embeddedness
 - Depth and current velocity

Accomplishments

Fish recruitment

– Otolith aging



Accomplishments

Riparian habitat

- Riparian vs. upland species success
- Seedling
 - Distribution/germination and survival
- Sapling
 - Distribution, recruitment, and survival
- Mature tree survival

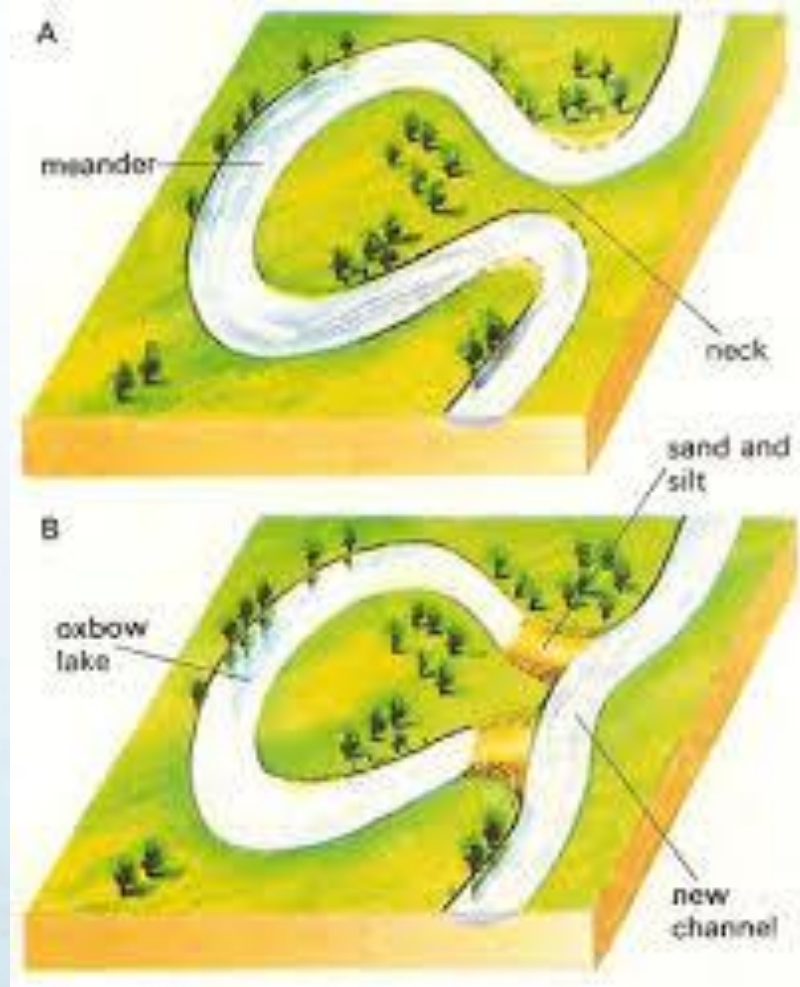
Indicator species

- Black Willow (*Salix nigra*)
 - Seed deposition early spring through summer
- Box Elder (*Acer negundo*)
 - Fall/overwinter
- Green Ash (*Fraxinus pennsylvanica*)
 - Spring and Fall/overwinter



Accomplishments

Oxbow connectivity



Accomplishments

Oxbow connectivity

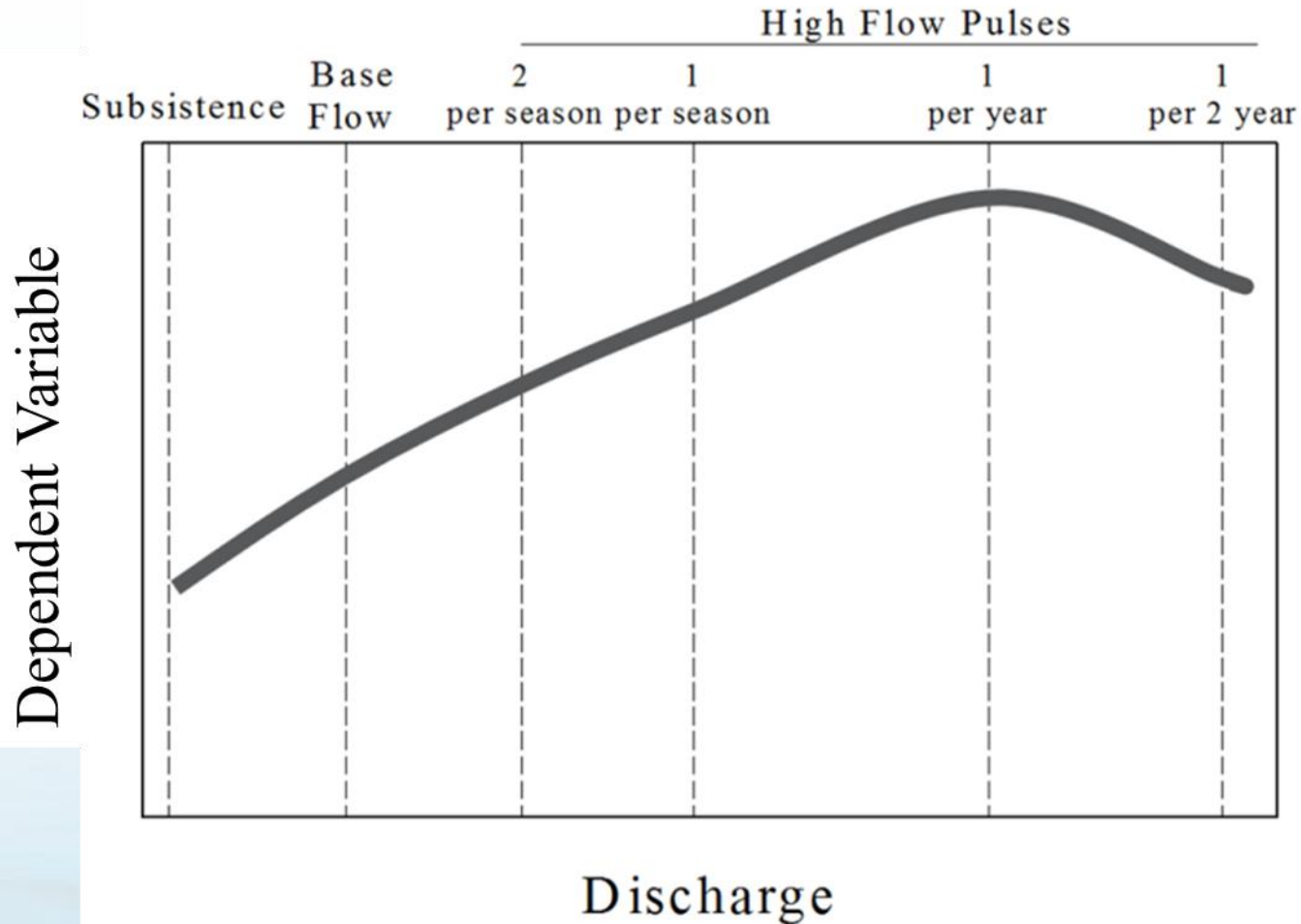
- Water levels to maintain connectivity
- Contribution to riverine diversity

Potential Outcomes

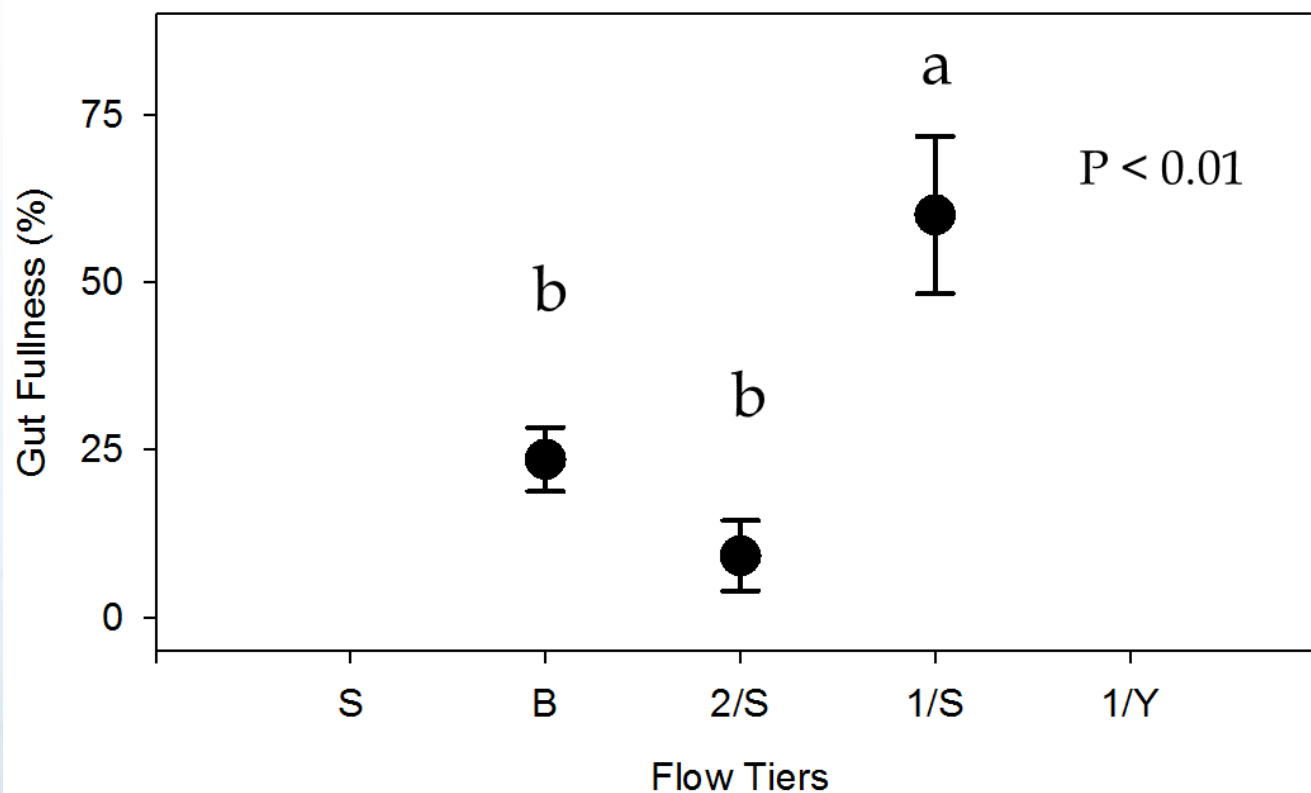
Table 4.1-15. GSA BBASC Environmental Flow Regime Recommendation - Guadalupe River at Cuero⁴⁹

Overbank Flows	Qp: 45,400 cfs with Average Frequency 1 per 5 years Regressed Volume is 869,000 Duration Bound is 91											
	Qp: 24,700 cfs with Average Frequency 1 per 2 years Regressed Volume is 406,000 Duration Bound is 64											
	Qp: 16,600 cfs with Average Frequency 1 per year Regressed Volume is 247,000 Duration Bound is 50											
High Flow Pulses	Qp: 4,610 cfs with Average Frequency 1 per season Regressed Volume is 55,300 Duration Bound is 26			Qp: 8,870 cfs with Average Frequency 1 per season Regressed Volume is 110,000 Duration Bound is 32			Qp: 2,110 cfs with Average Frequency 1 per season Regressed Volume is 19,300 Duration Bound is 17			Qp: 5,200 cfs with Average Frequency 1 per season Regressed Volume is 54,700 Duration Bound is 23		
	Qp: 1,610 cfs with Average Frequency 2 per season Regressed Volume is 14,100 Duration Bound is 13			Qp: 3,370 cfs with Average Frequency 2 per season Regressed Volume is 31,800 Duration Bound is 18			Qp: 1,050 cfs with Average Frequency 2 per season Regressed Volume is 8,300 Duration Bound is 12			Qp: 1,730 cfs with Average Frequency 2 per season Regressed Volume is 14,100 Duration Bound is 13		
Base Flows (cfs)	980			940			800			870		
				680			600					
				410			390					
Subsistence Flows (cfs)	130			120			130			86		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Winter			Spring			Summer			Fall		

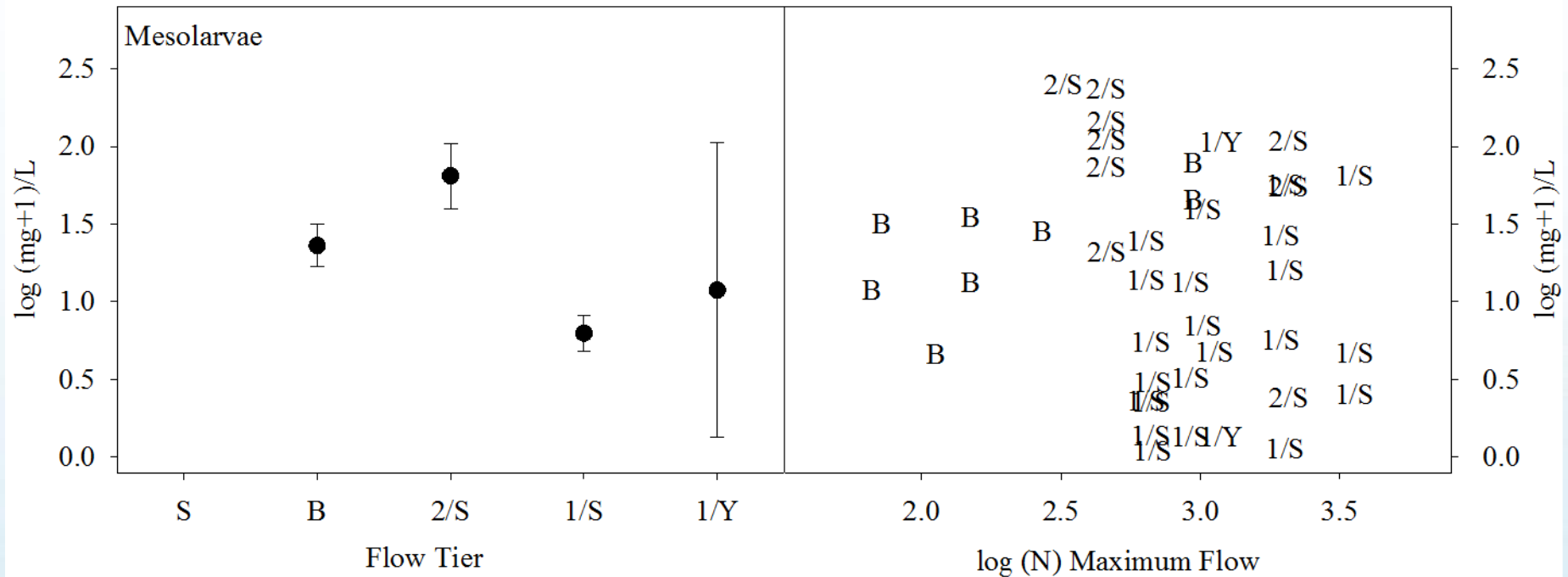
Potential Outcomes



Benefit for BBASC



Benefit for BBASC



Benefit for BBASC

